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THE ONTARIO WATER RESOURCES COMMISSION

REPORT ON

SUMMARY REPORT OF WASTE DISPOSAL

AT THE

SARNIA AREA INDUSTRIES

SARNIA, ONTARIO

JULY 15, 1964.

by

INDUSTRIAL WASTES BRANCH

ONTARIO WATER RESOURCES COMMISSION

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SUMMARY REPORT OF WASTE DISPOSAL AT THE SARNIA AREA INDUSTRIES

Introduction

All reports on the industries have not been completed but the following information is submitted for the use of the committee.

All the field work on the Sarnia industries has now been completed. The chemical analyses have not yet been completed on all the samples collected. The industries involved are as follows:

Polymer Corporation Limited,

Dow Chemical of Canada, Limited,

Shell Canada Limited, Sarnia Refinery,

Fiberglas Canada Limited,

Cabot Carbon of Canada Limited,

Du Pont of Canada Limited,

Sun Oil Company Limited,

Imperial Oil Enterprises Limited,

Ethyl Corporation of Canada Limited,

Allied Chemical Limited,

Mueller Limited.

Reports have been written and submitted for the surveys on Polymer Corporation and Dow Chemical. Reports in draft form only have been written on Shell Oil, Fiberglas, Cabot Carbon, Du Pont, and Ethyl Corporation. The reports on Sun Oil, Imperial Oil and Allied Chemical are being written.

The following are summaries of the various industries on which most of the information is available. All these industries discharge to the St. Clair River.

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DOW CHEMICAL OF CANADA, LIMITED

Products Caustic Soda, chlorine, ammonia, ethanolamines, ethylene glycols, polystyrene plastic and foam, latex polyethylene, ethylene chloride

Water Usage

Cooling	-	62 MGD
Process	-	9 MGD
Boiler House	-	2 MGD
Total	-	73 MGD

Waste Treatment

Styrene plant -all waste passes through an API separator.

Ethylene plant -all oily water directed to central API oil separator.

Latex plant -spillage, tank and reactor washings are directed to a coagulation flume in which latex is coagulated with calcium chloride and removed.

Glycol plant -lime and insolubles removed in a Dorr thickener. The effluent containing $CaCl_2$ and NaCl plus some organics is sewered.

. . . . . .continued on page 3.

Dow Chemical of Canada, Limited continued - -

Remarks

42" sewer	-high pH (11.1)
	-BOD in excess of OWRC's objectives (96 ppm)
First Street sewer	-excessive suspended solids (224 ppm) and highly alkaline (pH - 11.6)
First Street sluice	-BOD in excess of OWRC's objectives (62 ppm)
	-low pH (2.1)
Chlorine and caustic sewer	- suspended solids above OWRC's objectives (126 ppm)
	-high pH (11.3)
	-free chlorine discharge (20 ppm)

These constitute the undesirable characteristics of four of the eight drains considered individually. Considering the overall waste discharges at 70.3 MGD, the waste concentrations and loadings are as follows:

Constituent	Average Concentration ppm	lbs./day X1000
BOD	43	31.5
Suspended solids	31	22.7
Chloride as Cl	3,375	2,464

. . . . . .continued on page 4.

Dow Chemical of Canada, Limited continued - -

Although the above table shows that the daily BOD and suspended solids loadings are appreciable, for the most part they are due to the large volumes of waste being sewered and not to abnormally high concentrations in the individual discharges.

The figures for the chlorides discharged are very high in concentration and pounds per day and, although no concentration objectives for chlorides have been proposed by the OWRC or IJC due to lack of information on effect of such wastes, there is naturally concern regarding the ultimate effect of this constituent in the receiving waters. It has been stated that increasing chlorides could have a detrimental effect on the quality of boiler feed waters being taken from the St. Clair River.

The company should exercise all care and good housekeeping to keep the discharge of organic matter, suspended solids, and chlorides to a practicable minimum.

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POLYMER CORPORATION

Production

About 400 million pounds of several different types of synthetic rubbers and latices are produced each year. These include butyl rubbers, oil resistant rubbers, taktene and liquid latices.

Sources of Waste

Much of the water discharged is essentially uncontaminated cooling water. Hydrocarbon oils are lost at a number of locations such as the Monomer unit. These are collected in an oily water sewer and passed through an oil separator. Rubber fines and latex are removed in regional separators where a measure of chemical treatment is provided. These regional separators are connected to a secondary separator. Spent phenolic caustic and sulphur-bearing wastes are injected in a deep disposal well. Fly ash from the power house is slurried and pumped to a remote dumping ground. A certain amount of overflow from the slurry pit discharges to the river.

Waste Volume

Total waste flow - 121.94 MGD

Wastes to the St. Clair River

Constituent	Average concentration ppm	Loading lbs/day
BOD	19.7	24,110
Suspended solids	22.5	27,432
Copper	.3	355
NH_3	1	1,269
Phenols	.232	283.1

. . . . . .continued on page 6.

Polymer Corporation continued - -

REMARKS

Although the Biochemical Oxygen Demands of the various waste streams are generally low, the Chemical Oxygen Demands indicate high organic contents in some cases. The suspended solids in the four main effluents are quite low but they contain a good deal of organic matter. Ether soluble values are below OWRC's objectives.

The characteristic of greatest concern is the phenol level. Because of the large waste volumes, the loading is considerable. As most of the phenol occurs in the 66" sewer it probably originates in the oily water waste. While the other waste streams showed much lower levels of phenols, the concentrations are still in excess of the OWRC's objective of 20 ppb.

Suspended solids lost or discharged in the fly ash slurrying operation at the power house are excessive.

On the whole, the quality of the effluents, with the exception of a couple of characteristics, is good.

Recommendations

A general recommendation can be made regarding phenols. The company should endeavour to locate the sources of this contaminant and reduce the loadings to the lowest practicable levels either by segregation of wastes and/or treatment.

It is suggested that some method be developed whereby the fly ash sluicing overflow can be eliminated.

Losses of organics to the taktene sewer should be investigated and these losses reduced to the lowest possible level.

It is further suggested that all feasible provisions be made to prevent or contain accidental spills.

. . . . . .continued on page 7.

SHELL CANADA LIMITED - SARNIA REFINERY

The Sarnia Refinery of Shell Canada Limited was acquired in 1963 from Canadian Oil Companies, Limited, when the facilities of the latter throughout Canada were purchased by Shell.

The refinery produces a wide range of products, ranging from motor and heating fuels to lubricating oils, solvents, etc.

Rated Production -40,000 barrels per day (Canadian crude)

Operating Schedule -24 hours per day
- 7 days per week

Water Supply -32 MGD (winter)
-40 MGD (summer)
-(pumped from St. Clair River)
-Distribution - Ethyl Corporation 3.6 MGD (summer)
- Boiler 0.6 MGD
- Cooling 14.4 MGD (winter)
17.9 MGD (summer)
- Process 17- 18 MGD

Waste Water Disposal -Waste waters are divided into three main classes:

(a) Oily water, containing all process wastes from the unit areas - approximate flow 2.5 MGD.

. . . . . .continued on page 8.

Shell Canada Limited - Sarnia Refinery continued - -

(b) Potentially oily waters, mainly drainage from the tank farm and other areas where oily wastes are not usually found but where there is some possibility of spills or carry-off of oil by storm water - approximate flow 3.5 MGD.

(c) Clean water, consisting of cooling waters that do not come into contact with oil or products. (This represents the great bulk of waste water flow from the refinery)

The oily water and potentially oily water streams are each served by separators to trap and remove oil by skimming or decanting. These effluents then are discharged to a common sewer and thence to Talford Creek, a tributary to the St. Clair River. The clean water sewer discharges to Talford Creek with no treatment. A boom with oil collecting arrangement is provided below the outfalls in the creek to prevent residual oil from reaching the river.

Deep Well Disposal -Strong caustic phenolates are recovered from catalytic cracking wastes and sold while "weak" phenolic solution resulting from the recovery process is disposed of in a deep well.

Sour water arising from desulphurization of various products is also pumped to the deep well.

Depth of well	-	940 feet
Diameter	-	6-1/4" at disposal depth
		7" above " "
Injection Pressure	-	225 psi.

. . . . . .continued on page 9.

Shell Canada Limited - Sarnia Refinery continued - -

Total Waste Loadings

(Oily and Potentially Oily Wastes)

Flow	-	6.0 MGD
BOD	-	10,000 lbs. per day (approx.)
COD	-	30,000 lbs. per day (approx.)
Suspended Solids	-	400 lbs. per day (approx.)
Phenols	-	70 lbs. per day (approx.)
Oil	-	Trace.

During the most recent survey (February, 1964) a distinct benzene-like odour was noted in the potentially oily waste. This characteristic, together with the discharge of a significant quantity of phenol indicates the need for improved treatment or waste control.

Biological Treatment

Trickling filter treatment of phenolic wastes has been abandoned in favour of deep well disposal, although the treatment facilities are maintained in readiness should they be required. In view of the levels of phenols, BOD, and COD found in the effluent, consideration should perhaps now be given to using this treatment as a "polishing" step prior to discharge of the wastes to the river.

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Fiberglas Canada Limited - Sarnia

The plant of Fiberglas Canada Limited is located at the southern limits of the City of Sarnia, upstream from the major petrochemical and chemical industries in the Sarnia group with respect to water-use and waste disposal.

Production -Insulating materials from spun glass.

Operating Schedule -24 hours per day.
- 7 days per week.

Number of Employees -450.

Raw Materials

-Raw materials for the production of the spun glass and subsequent processing into bound insulation include silica, borax, soda ash, limestone, nephtheline syenite, dolomite, phenol formaldehyde resins (made at the plant), ammonia, mineral oil, sulphuric acid, and caustic soda.

Water Supply

-For sanitary use purchased from Sarnia P.U.C. - 10,000 gpd.

-Industrial water is purchased from Polymer Corporation -900,000 gpd.

. . . . . .continued on page 11.

Fiberglas Canada Limited - Sarnia

Sources of Wastes

The main sources of contaminated waste waters are gas scrubber water, resin production and application, and roof drainage.

Waste Disposal

All industrial wastes are discharged without treatment to a County Ditch running parallel to Highway #40, and thence to the St. Clair River. Estimated volume of waste flow was 860,000 gallons per day in May, 1964, with a measured phenol content at that time of from 2,000 to 3,000 parts per billion. (OWRC's Objective for phenol concentration in effluent: 20 ppb.) All other waste components were suitably controlled.

Corrective Action

Fiberglas has completed extensive studies into the application of chemical oxidation to phenolic wastes. Pilot plant tests have shown that phenols are successfully destroyed by reaction with chlorine dioxide, and plans are now being finalized for a plant-scale installation in the near future.

. . . . . .continued on page 12.

CABOT CARBON OF CANADA LIMITED

Products

-Pelletized carbon black from aromatic residual oils.

Operation

-Heavy aromatic oil residuals are burned with incomplete combustion. Carbon black produced is pelletized.

Water Usage

-Water is used for quenching and cooling in the process. Quench water is lost up the stack. Only discharge from plant is cooling water.

-Domestic purposes 3,000 gpd.

-Process Water 150,000 gpd.

-Cooling Water 36,000 gpd re-used.

36,000-72,000 gpd discharged to the County Ditch to St. Clair River.

Waste Disposal

-Normally uncontaminated cooling water to ditch.

-Oil traps to catch miscellaneous spills.

-Domestic waste to sanitary sewer.

. . . . . .continued on page 13.

Cabot Carbon of Canada Limited continued - -

Waste Quality

Constituent	Average Concentration ppm	Average Loading lbs/day Summer	Winter
BOD	2	1.4	0.72
Suspended solids	21	15.2	7.6
Phenols	0.042	0.03	.015

Remarks

Analytical results indicate that the wastes are generally of acceptable quality for discharge to a watercourse. Phenols are slightly above OWRC's objectives but probably are coming from trace amounts of oil remaining in the ditches. The presence of finely divided carbon particles gives the discharge a blackish colour. However, suspended solids concentrations are within a reasonable range.

Conclusions and Recommendations

The effluent from this company is acceptable for discharge to the watercourse. The company should take precautions to insure that no oil escapes to the ditches bordering the plant in the future. A regular inspection of these ditches should be instituted so that any such losses of oil are noted quickly and remedial steps taken immediately.

. . . . . .continued on page 14.

DuPONT OF CANADA LIMITED, CORUNNA

Products

-Pelletized polyethylene is the sole product.

Operation

The pelletized polyethylene is produced using ethylene, cyclohexane and catalysts. Dowtherm A is used to heat the still used in the process. This is a chlorinated biphenyl which could degrade to phenolic-type taste producers.

Water Supply and Usage

-Domestic water - from Moore Township (Sarnia) - 5,000 gpd.

-Industrial water " St. Clair River - 5.0 MGD.

Of the industrial water supplied, 8,600 gpd are used for washing ketone from the cyclohexane solvent. The remainder is used for cooling and boiler water make-up.

Waste Disposal

Wastes from the product cooling bath discharge to a ditch and flow to the St. Clair River. All other wastes, which constitute the majority of waste flow, pass through a skimming pond for recovery of any escaping solvent and then flow via a ditch to the St. Clair River.

. . . . . .continued on page 15.

DuPont of Canada Limited, Corunna continued - -

Waste Concentrations and Leadings

Constituent	Average Concentration ppm	Loading lbs/day
BOD	3.8	19
Suspended solids	20	1,000
Phenols	.006	0.3

Remarks

The analytical results of samples taken indicate that the waste is acceptable for discharge to a watercourse. Sampling carried out during a period when plant operation was normal showed that no contaminating constituents were present in the water in objectionable concentrations.

. . . . . .continued on page 16.

SUN OIL COMPANY, LIMITED, SARNIA

The Sun Oil Company, Limited is located on the east side of Highway #40 on the St. Clair River at the southern limits of the City of Sarnia.

Production -Gasoline, fuel oil, bunker oil, light gas streams, and butane. Fuel gas is retained for plant use. Some hydrogen, occurring as a by-product is sold.

Raw Material -Approximately 25,000 barrels of crude oil are processed daily.

Water Supply -Sanitary and drinking supply from the Sarnia P.U.C. - 3,000 gpd.

-Industrial water drawn from St. Clair River - 12 to 14 MGD.

(a) Process: 300,000 gpd.

(b) Cooling: 11.7 to 13.7 MGD.

Sources of Waste -Cooling water represents the major waste flow, as indicated above, and is discharged to two separators separate from the process wastes.

-Process wastes originate from crude oil desalting, gasoline washing, tank and vessel draining, pump gland leakage, and general refinery clean-up operations.

-Storm water run-off is a potential source of pollution.

Waste Treatment and Disposal

(a) Cooling water - directed to two A.P.I. separators for removal of sludge and oil.

(b) Process wastes- directed to hydrogen sulphide stripper, then to an A.P.I. separator for removal of sludge and oil, then to bio-oxidation unit for

. . . . . .continued on page 17.

Sun Oil Company, Limited, Sarnia continued - -

phenol destruction. The effluent from bio-oxidation is sent to a clarifier for removal of activated sludge and discharge of the clarified supernatant to the river. The activated sludge is returned to the bio-oxidation unit. (Note: Should the hydrogen sulphide stripper be out of service, the process waste waters by-pass the bio-oxidation unit for direct discharge to the river.)

(c) Storm waters, pump cooling water, bilge water, etc., which may contain oil but do not contain phenol, are directed to two A.P.I. separators for oil and sludge removal similar to those used for cooling water treatment.

All sludges collected from separators are pumped to sludge dewatering pits for disposal, with the supernatant from the pits returned to the bio-oxidation unit for complete treatment.

Waste Characteristics

Waste water quality (in the combined effluent) is satisfactory except for phenol content. Phenols were present in a concentration of 175 parts per billion, well above the recommended limit of 20 ppb. Upstream sources of phenol are to be considered also, since analysis showed 40 ppb in the raw water supply.

Conclusions

Although the source of phenol in the final outfall was not determined, it is suspected that leakage from the process water treatment to the by-pass around the bio-oxidation unit may have been at fault.

. . . . . .continued on page 18.

ETHYL CORPORATION OF CANADA LIMITED, CORUNNA

The plant of Ethyl Corporation of Canada, Limited, located downstream from the major industries in the Sarnia group, consists of three main production units, producing tetraethyl lead, ethyl chloride, and ethylene dichloride.

Water Supply

Water is purchased from the neighboring Shell Canada plant, for both drinking and industrial use. Shell, in turn, purchases the drinking water supply from the municipality of Corunna and pumps industrial water from the St. Clair River.

Industrial consumption at Ethyl Corporation
varies from 3.7 MGD in winter to
approx. - 4.8 MGD in summer.

Waste Water Treatment and Disposal

(a) Tetraethyl lead process - wastes arise mainly from steam distillation, with lesser flows from tetraethyl lead purification, tank washing, and plant clean-up. Treatment includes chemical flocculation, sedimentation, sludge removal, lead recovery, and pH adjustment. The clarified effluent is discharged in mixture with clean cooling water.

. . . . . .continued on page 19.

Ethyl Corporation of Canada Limited, Corunna continued - -

(b) Ethyl chloride and ethylene dichloride wastes consist mainly of acidic waters resulting from scrubbing free hydrogin chloride from waste gases. The acid wastes are passed through a pit charged with crushed limestone for neutralization.

(c) The total plant waste, 10% of which originates as process waste as described in (a) and (b) above (370,000 gallons per day, and the remainder (some 3.5 to 4.5 million gallons per day), is discharged by an extended submerged outfall to the edge of the shipping channel for maximum dispersion in the river.

Plant Expansion

Facilities are presently under construction for operation toward the end of 1964 for the production of additional products. A waste treatment proposal has been submitted to the OWRC and is under consideration.

Survey Findings

Waste treatment and control at the Ethyl Corporation plant at Corunna has been found to be satisfactory, with the concentration of all waste components falling within the Objectives for Water Quality. Phenol has been recorded in the effluent in significant concentration but this is thought to originate in the river upstream and to appear in the process waste as a result of the quality of the raw water supply.

. . . . . .continued on page 20.

MUELLER LIMITED, SARNIA

The plant of Mueller Limited is located adjacent to the St. Clair River in the City of Sarnia, upstream from the major process industries in the area.

Production

-Plumbing goods, gas and water valves. Rough cast components are tumbled in water to remove "burrs," rough edges, sand and grit. Parts are cleaned and plated in conventional plating room practices, involving: alkali cleaning, tank and spray rinsing, and copper, chrome, nickel, and cadmium plating as required.

Number of Employees

-375.

Operating Schedule

-8 hours per day.

-5 days per week.

Water Use

-Approximately 110,000 gallons per day (total), supplied by the Sarnia PHC. with the approximate in-plant use:

(a)	Sanitary	-	10,000 gpd.
(b)	Cooling	-	30,000 gpd.
(c)	Plating	-	20,000 gpd.
(d)	Tumbling	-	50,000 gpd.

. . . . . .continued on page 21.

Mueller Limited, Sarnia continued - -

Waste Disposal

-All sanitary and industrial wastes are discharged without treatment to the St. Clair River. Five outfalls serve the plant.

Waste Characteristics

-Three of the five outfall sewers carry process wastes containing excessive concentrations of suspended solids and/or plating wastes (cyanide, chromium, and copper). As indicated above, all sanitary wastes are discharged to the river without treatment.

Recommendations

-Treatment facilities to remove suspended solids from the tumbling machine waste (by sedimentation), destroy cyanide (for example by alkaline chlorination) and to precipitate metal components are required to provide a satisfactory effluent either to the river, as at present, or for re-direction to the municipal sanitary sewerage system.

-All sanitary wastes should be segregated from the industrial wastes for discharge to the municipal sanitary sewerage system.

. . . . . .continued on page 22.

IMPERIAL OIL ENTERPRISES LIMITED

Imperial Oil Enterprises Limited is located on the St. Clair River in the City of Sarnia. This company, the largest oil refinery in Canada, produces more than 600 petroleum products including gasoline, fuel oil, lubricating oils, waxes, benzene, butadiene, ethylene and detergent alkylate.

An industrial waste survey was carried out at this refinery on June 16 and 17, 1964.

Rated Production

The refinery processes 90,000 barrels of crude oil per day.

Operating Schedule

The refinery operates continuously.

Process Units

The refinery is divided into three main plants. The major processing units in each plant are listed below:

Plant #1: - 1. Dewaxing plant,

2. Recrystalizer - wax,

3. Lube Oil and Wax Hydrofiners,

4. Topping and Coking Unit - Crude Unit,

5. Lube Additive Plant,

. . . . . .continued on page 23.

Imperial Oil Enterprises Limited continued - -

Plant #1:
6. Clay Plant (largely shutdown - lube oil treatment),
7. Grease Plant,
8. Packaging Plant,
9. Naphtha Specialty Unit.

Plant #2: -
1. Atmospheric and Vacuum Unit - Crude,
2. Boiler House,
3. Debutanizer, Stabilizing, Adsorption (D.S.A.) - Light Ends,
4. Phenol Plant - Lube Oil Treating,
5. Powerformer - Improving Octane,
6. Asphalt Plant,
7. Detergent Plant,
8. Central Treating Plant.

Plant #3: - Chemical Products Cracking Unit.

1. Butadiene,
2. Ethylene,
3. Benzene,
4. Pour Depressant.

Water Supply and Distribution

The refinery obtains all industrial water from the St. Clair River. Three pump houses are maintained and operated by the company and supply from 73 MIGD in the summer to 52 MIGD in the winter.

. . . . . .continued on page 24.

Imperial Oil Enterprises Limited continued - -

Based on waste water flows, the water distribution at the time of the survey was estimated as follows:

Plant #1	-	19.5 MIGD,
Plant #2	-	28.2 MIGD,
Plant #3	-	1.4 MIGD,
Total	-	49.1 MIGD.

The above figures are only estimates and do not account for water discharged to deep wells, water lost as steam, evaporation losses, etc.

Waste Water Disposal

Waste water originating in the refinery is, in general, segregated into three streams; clean spent cooling water, oily waste water and waste water containing high phenolic concentrations.

Clean spent cooling water and oily waste waters are passed through A.P.I. separators for the recovery of oil and sludge while wastes high in phenolics are disposed of to 5 deep wells. Approximately 7,000 bbls. or 250,000 Imperial gallons of phenolic wastes are charged to the wells daily and approximately 50 MIGD of treated waste water was being charged to the St. Clair River at the time of sampling.

. . . . . .continued on page 25.

Imperial Oil Enterprises Limited continued - -

Sampling Programme

Waste sampling was carried out on June 17, 1964. All samples taken were composited at 30-minute intervals over the indicated period. The location and nature of samples are indicated on the attached result sheet.

Summary of Waste Loadings

The following is a table summarizing waste loadings as calculated by averaging concentrations of contaminants found in the waste on July 17, 1964:

Summary of Waste Loadings

Source (All flows discharging to St. Clair River)	Flow MIGD	BOD lbs/day	Suspended Solids lbs/day	COD lbs/day	Phenols lbs/day	Ether Solubles lbs/day
Plant #1:						
Separator # 3-North Bay	15.6	-	1,170	-	0	-
Separator # 5	3.9	1,268	1,170	4,190	3.7	1,325
Total Plant #1 - - - -	19.5	1,268	2,340	4,190	3.7	1,325
Plant #2:						
Separator # 9	13.0	1,720	1,170	2,590	5.2	0
Separator #10	1.81	551	407	1,670	2.04	190
Separator #11	5.4	567	270	1,810	1.89	54
Separator #12	8.0	1,760	1,600	3,180	5.6	0
Total Plant #2 - - - -	28.21	4,598	3,447	9,250	14.73	244
Plant #3:						
Impounding Basin Discharge	1.4	364	1,090	2,620	2.45	70
Total Refinery Discharge to St. Clair River	49.1	6,230	6,877	16,060	20.9	1,639

. . . . . .continued on page 26.

Imperial Oil Enterprises Limited continued - -

Source	Nature of Sample	BOD	Solids Total	Solids Susp.	Solids Diss.	pH at Lab.	COD	Chlorides as Cl	Phenols ppb	Ether Solubles
Separator No. 3-N.	Comp. 8:45 a.m.- 3:15 p.m.	-	146	9	137	8.1	0	8	0	-
Separator No. 3-N.	Comp. 10:45 a.m.- 2:45 p.m.	-	140	6	134	-	-	-	-	-
Separator No. 3-S.	Comp. 8:45 a.m.-12:15 p.m.	5.2	160	19	141	11.1	32	8	35	-
Separator No. 3-S.	Comp. 12:45 p.m.- 3:15 p.m.	5.2	144	19	125	9.0	55.7	8	35	-
Separator No. 3-S.	Comp. 10:45 a.m.- 2:45 p.m.	-	-	-	-	-	-	-	-	8
Separator No. 4	Comp. 8:50 a.m.-12:20 p.m.	40	190	11	179	6.8	83.8	9	500	8
Separator No. 4	Comp. 12:50 p.m.- 3:20 p.m.	47	148	12	136	6.9	99.6	8	750	9
Separator No. 5	Comp. 9:00 a.m.-12:30 p.m.	37	256	28	228	6.7	95.6	39	90	40
Separator No. 5	Comp. 1:00 p.m.- 3:30 p.m.	28	282	32	250	6.7	119	51	100	28
Separator No. 9	Comp. 8:30 a.m.- 3:30 p.m.	13.2	178	9	169	6.6	19.9	19	40	0
Separator No. 10	Comp. 8:30 a.m.-12 Noon	35	200	24	176	6.9	101.2	16	100	10
Separator No. 10	Comp. 12:30 p.m.- 3:30 p.m.	26	190	21	169	7.0	82.9	15	125	11
Separator No. 11	Comp. 9:00 a.m.-12 Noon	11	220	1	219	6.8	35.5	31	30	0
Separator No. 11	Comp. 12:30 p.m.-3:30 p.m.	10	210	9	201	6.9	31.5	31	40	2
Separator No. 12	Comp. 9:00 a.m.- 3:30 p.m.	22	238	20	218	7.0	39.8	26	70	0
Discharge from Impounding Basin Plant #3	Comp. 8:15 a.m.- 3:15 p.m.	26	260	78	182	9.1	186	91	175	5
River Water Supply	Comp. 8:30 a.m.- 3:30 p.m.	-	-	-	-	8.2	7.96	8	0	-

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Imperial Oil Enterprises Limited continued - -

Discussion of Survey

Survey results indicate that the waste disposal procedures followed by this refinery are in general satisfactory. Indicated phenol and ether soluble loadings placed on the river are quite low for the size of the refinery. During the period of sampling, bottom sludge was being removed from the middle bay of separator No. 5 by the Goodfellow Construction Company. Hence, the retention time of this separator was being reduced by 1/3 and, as well, the contents of the middle bay, which were being pumped to the other two bays, were carrying a great deal of oily sludge. Thus, it is quite conceivable that loadings attributed to this separator would be much reduced during normal operation. Highest phenol concentrations were detected in the plant No. 3 discharge. However, this plant is responsible for only a small portion of the total waste discharge.

Efforts should be continued to reduce loadings to the river as samples taken downstream at various times in the past months indicate that phenol concentrations are considerably higher than I.J.C.'s objectives.